UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/719,215	02/26/2001	Colin Forno	1028-0166P	7097

2292 7590 03/14/2003

BIRCH STEWART KOLASCH & BIRCH
PO BOX 747
FALLS CHURCH, VA 22040-0747

EXAMINER
HO, ALLEN C

ART UNIT	PAPER NUMBER
2882	

DATE MAILED: 03/14/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/719,215	FORNO ET AL.
	Examiner	Art Unit
	Allen C. Ho	2882

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02 December 2002* .

2a)☒ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-33* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-32* is/are rejected.

7)☒ Claim(s) *33* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Claim Objections

1. Claim 18 is objected to because of the following informalities:

Claim 18 recites the limitation "the recorded image". There is insufficient antecedent basis for this limitation in the claim.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1, 3, 5-9, and 10-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lulli *et al.* (U. S. Patent No. 5,870,196) in view of Duffy (U. S. Patent No. 3,767,308) and Hecht *et al.* (1979).

Lulli *et al.* disclosed a measurement method comprising the steps of: arranging a Michelson interferometer (Fig. 1) to form a first interference fringe pattern comprising at least fifty interference fringes (speckle pattern); recording a digital image (Mx) of the first interference fringe pattern using a CCD camera (**59**); perturbing (**47**, **57**) an optical path in the interferometer by translating a reflecting surface (**43**) to form a second interference fringe pattern comprising at least ten interference fringes; storing and processing the images using a central

processing unit (**14**); and combining a digital image (Mx+1) of the second interference fringe pattern with the recorded image of the first interference fringe pattern to produce a further image comprising a fringe pattern arising from a difference or differences between the first and second interference fringe patterns (Md = |Mx - Mx+1|), wherein the negative values are converted to positive values. Moreover, Lulli *et al.* disclosed a measurement method comprising the steps of: combining the recorded image with each one of a sequence of images of the interference fringe pattern at respective different times to produce a sequence of respective further images each comprising a fringe pattern arising from a difference between the recorded image and the respective one of the sequence of images (step **109**). The sequence of images are captured and displayed (**14a**) at a certain rate as determined by the loop in the algorithm (Fig. 3).

However, Lulli *et al.* did not teach that: (1) the fringe pattern formed from a difference or differences between two interference fringe patterns is a moiré fringe pattern; (2) the interferometer is arranged to form non-speckle interference fringe pattern; and (3) the step of perturbing includes: inserting a transparent object in the optical path; distorting, rotating, and translating a transparent object in the optical path; replacing a reference object with a test object; and disturbing a gas flow in the optical path.

Duffy disclosed that a moiré fringe pattern is obtained by superimposing two successive interference fringe patterns, and that the moiré fringe pattern indicates the change (displacement) in the successive interference fringe patterns.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine two successive interference fringe patterns to form a moiré

fringe pattern, since a person would be motivated to study the change in a sample as a function of depth.

Furthermore, although Lulli *et al.* disclosed a measurement method and apparatus employing speckle interferometry, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to apply the same method to classical interferometry that forms non-speckle interference fringe patterns. It is well known that the Michelson interferometer, as disclosed by Lulli *et al.*, was one of the first classical interferometers. The Michelson interferometer employs smooth mirrors in both optical paths, and it is capable of detecting a minute change introduced into one of the optical paths. In fact, Lulli *et al.* taught that one would get a classical interference pattern (Fig. 2a) if a mirror were mounted on the support device (column 3, lines 47-56) instead of a sample with a rough surface, which produces speckle patterns when illuminated by light. Hecht *et al.* taught that any object positioned in one of the optical paths would alter the optical path-length difference, thereby changing the fringe pattern. For instance, a common application of a classical interferometer is to observe the density variation in gas-flow patterns within a sample chamber (Hecht *et al.*, p. 290, paragraph 5). The method disclosed by Lulli *et al.* was designed to study the change in the sample as a function of depth; it would have been obvious that the same method could be applied to study change in a sample positioned in one of the optical paths in a classical interferometer.

In addition, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to choose from any method for perturbing an optical path based solely on the application of an interferometer absent any showing of criticality. The lack of criticality is demonstrated by applicant's claiming of a plurality of methods for perturbing an optical path.

4. Claims 2 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lulli *et al.* (U. S. Patent No. 5,870,196) and Duffy (U. S. Patent No. 3,767,308) as applied to claim 1 above, and further in view of Noguchi *et al.* (U. S. Patent No. 5,432,606).

Lulli *et al.* in combination with Duffy disclosed a measurement method as set forth in claim 1.

However, these references do not teach a step of tilting a reflecting surface of the interferometer to increase the number of interference fringes in the first interference fringe pattern.

Noguchi *et al.* taught tilting a reference mirror (**5**) to increase the number of interference fringes.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to adjust the tilt of a reflecting surface in an interferometer in order to increase the number of fringes, since a person would be motivated to increase the number of fringes in order to facilitate interferometric measurement.

Allowable Subject Matter

5. The indicated allowability of claims 4, 5, and 7-9 is withdrawn in view of the newly discovered reference(s) to Hecht *et al.* (1979).

6. Claims 33 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: The allowable subject matter in claim 33 refers to a measurement method in accordance with claim 23, wherein the interferometer has an aperture of at least 10 cm.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

(1) Park *et al.* (U. S. Patent No. 5,459,578) disclosed a method for measuring displacement by Moiré fringes of concentric circles.

(2) Rizzo (U. S. Patent No. 3,825,346) disclosed interferometers for fluid flow measurements.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Allen C. Ho whose telephone number is (703) 308-6189. The examiner can normally be reached on Monday - Friday from 8:00 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert H. Kim can be reached at (703) 305-3492. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0530.

Allen C. Ho
Examiner
Art Unit 2882

ACH
March 10, 2003